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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

OIPE IAP43 APR 03 2006 PATENT & TRADEMARK OFFICE

In re application of: Lofland et al.

Attorney Docket No.: CALIP008/P068

Patent: 6,959,126 B1

Issued: October 25, 2005

Title: MULTIPURPOSE TESTING SYSTEM FOR OPTICAL CROSS CONNECT DEVICES

CERTIFICATE OF MAILING
I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as first-class mail on March 31, 2006 in an envelope addressed to the Commissioner for Patents, P.O. Box 1450 Alexandria, VA 22313-1450.

Signed: ______________________
Aurelia M. Sanchez

REQUEST FOR CERTIFICATE OF CORRECTION OF OFFICE MISTAKE (35 U.S.C. §254, 37 CFR §1.322)

Certificate
APR 06 2006
of Correction

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Attn: Certificate of Correction

Dear Sir:

Attached is Form PTO-1050 (Certificate of Correction) at least one copy of which is suitable for printing. The errors together with the exact page and line number where the errors are shown correctly in the application file are as follows:

SPECIFICATION:

1. Column 7, line 32, change **second instance** of “or” to --of--. This appears correctly in the patent application as filed on February 8, 2002, on page 12, line 22.

2. Column 10, line 9, change “in according” to --in accordance--. This appears correctly in the patent application as filed on February 8, 2002, on page 16, line 22.

3. Column 12, line 28, change “optional” to --optical--. This appears correctly in the patent application as filed on February 8, 2002, on page 19, line 32.

4. Column 12, line 50, change “occur is” to --occur if--. This appears correctly in the patent application as filed on February 8, 2002, on page 20, line 14.

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CLAIMS:

1. In line 3 of claim 16 (column 17, line 33) delete "under". This appears correctly in Amendment B as filed on February 17, 2005, on page 5, paragraph 3, line 3.

2. In line 12 of claim 16 (column 17, line 41) change "OSTS" to --DUT--. This appears correctly in Amendment B as filed on February 17, 2005, on page 5, paragraph 3, line 8.

Patentee hereby requests expedited issuance of the Certificate of Correction because the error lies with the Office and because the error is clearly disclosed in the records of the Office. As required for expedited issuance, enclosed is documentation that unequivocally supports the patentee's assertion without needing reference to the patent file wrapper.

It is noted that the above-identified errors were printing errors that apparently occurred during the printing process. Accordingly, it is believed that no fees are due in connection with the filing of this Request for Certificate of Correction. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 500388 (Order No. CALIP008).

Respectfully submitted,
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APR 07 2006

Optical signals from the E/O converter 404 are directed to appropriate output ports 406 of the OSTD. In one implementation, a designated output port may be specified in the configuration information stored within register 402a. Optical test signals from the OSTD are provided from the output ports 406 to selected input ports of the DUT via a plurality of optical fibers 407. In one implementation, the number of output ports of the OSTD may be at least equal to the number of active input ports associated with the DUT. Further, according to a specific implementation, the number of modulator circuits 402 included with the OSTD may be at least equal to the number of active input ports associated with the DUT. Such a configuration allows multiple input ports of the DUT to be tested simultaneously.

Output optical signals from the output ports of the DUT are fed to a plurality of photodetector circuits 410 which reside at the OSTD 400. According to a specific embodiment, the number of photodetector circuits included within the OSTD may be at least equal to the number of active output ports of the DUT.

As shown in the embodiment of FIGURE 4, each photodetector circuit 410 may include a photodetector 412, and an amplifier 414. The photodetector 412 converts optical signals into electrical signals, which may then be amplified by amplifier 414. The signals from the photodetector circuit 410 are fed to one of a plurality of demodulator circuits 416 which are configured to demodulate and process the signals generated at the photodetector circuits. According to a specific implementation, the demodulator circuits may be configured or designed to measure various characteristics of optical signals.

As shown in the embodiment of FIGURE 4, a plurality of demodulator circuits 416 may be provided at the OSTD in order to allow multiple signals from multiple photodetector circuits to be processed simultaneously. According to a specific implementation, the demodulator circuits may be arranged in an 8x1 configuration. Each demodulator circuit 416 may include at least one register 416a which may be used for storing configuration information and/or other information, such as, for example, timer count values, MAX_PORT value, pulse counter value, etc. The demodulator circuit may also include at least one counter 416b which may be configured to function as a local timer.

talk properties of the DUT may be measured during transitional conditions (e.g. during active switching of optical paths at the DUT). Once the DUT has been properly configured, the stimulus and detection procedures may be implemented at the OSTD to provide appropriate test stimulus to the DUT, and to detect desired results. The test results associated with test scenario B may then be retrieved (23) from the OSTD and analyzed (25) by the computer system. The analyzed test results may then be reported to the user via the computer system interface.

It will be appreciated that, in the embodiment of FIGURE 8, any number of desired tests may be performed upon the DUT by the optical switch testing system of the present invention by continually reconfiguring the DUT for different test scenarios, implementing the stimulus and detection procedures for each test scenario, and retrieving the desired test results from the OSTD. According to a specific implementation, the stimulus and detection procedures may be designed to run continuously at the OSTD in order to allow new test scenarios to be continuously implemented at the DUT, thereby allowing different test results to be continuously retrieved from the OSTD. Alternatively, once a particular test scenario has been configured at the DUT, the computer system may send a signal to the OSTD to initiate the stimulus and detection procedures for that specific test scenario. According to specific embodiments, different stimulus and detection procedures may be implemented for different test scenarios, if desired.

FIGURE 6 shows a flow diagram of a Stimulus Test Procedure 600 in accordance with a specific embodiment of the present invention. According to one implementation, the Stimulus Test Procedure 600 may be implemented at the optical test stimulation component 313 of FIGURE 3. Additionally, according to a specific implementation, a separate instance of the Stimulus Test Procedure may be implemented for each modulator circuit residing in the optical test stimulation component of the OSTD. According to a different embodiment, the number of instances of the Stimulus Test Procedure may be equal to the number of active ports identified at the DUT. One function of the Stimulus Test Procedure is to provide one or more optical test signals to the DUT. Initially, as shown at 602, the Stimulus Test Procedure waits to receive a Frame_Sync signal. In one implementation, the Frame_Sync may be used to synchronize stimulus test patterns generated by the optical

light pulse was first detected or received) is recorded. This information may subsequently be analyzed in order to determine the operating functionality and/or specific characteristics of the DUT.

As described previously, the optical switch testing system of the present invention may be used to perform a variety of tests on one or more DUTs. FIGURE 9 shows a block diagram of a DUT 910 which may be tested in accordance with the technique of the present invention. In the example of FIGURE 9, it is assumed that the DUT 910 corresponds to an N x M optical switch which includes N input ports 903 and M output ports 905. Using the DUT embodiment of FIGURE 9, a variety of different test approaches which may be implemented by the optical switch testing system of the present invention will now be described. It will be appreciated that the tests described below represent a portion of the tests which may be performed upon a DUT by the OSTS of the present invention. Other tests not specifically mentioned in this application may also be performed. Such other tests will generally be known to one having ordinary skill in the relevant art.

One type of test which may be performed by the OSTS of the present invention is the measurement of optical cross talk of the DUT, for example, during both static and transitional states of the DUT. The static optical cross talk test may be performed in order to measure the amount of light that is received from paths adjacent to or near a particular optical path under test. For example, according to a specific implementation, the path under test may be darkened and a sensor connected to the path output. The sensor may be zeroed, and then set to detect light at the output of the path under test (PUT). According to a specific implementation, the sensor may correspond to photodetect circuit 410 of FIGURE 4, and may be configured to detect light which is above a predetermined threshold value, or may be configured to latch a maximum power value of light detected at the output port of the PUT.

During the static optical cross talk test, optical signals may be sent along adjacent or near paths (as determined by analysis) to the path under test while the path under test remains darkened (e.g. off). According to a specific embodiment, at least a portion of the optical signals may be simultaneously transmitted along the adjacent paths. The readings from the sensor(s) connected to the path under test may then be used to determine pass/fail. According to different embodiments, the static optical

cross talk test may be repeated for all desired combinations of paths, wavelengths, and/or polarization states which analysis shows to be relevant.

During a transitional optical cross talk test, the amount of light that is received by neutral paths may be measured as a test path is switched to a new path. Thus, for example, according to a specific embodiment, all or a selected portion of paths may be darkened except for the path being switched. Optical test signals may then be sent along the path being switched at the DUT. The selected darkened paths are monitored for the presence of light while the test path is switched back and forth repeatedly. The darkened paths being monitored may then be examined for the presence of any detected light. According to a specific implementation, the photodetector circuits may be configured to also record the power level of any light detected on the darkened path(s).

According to a specific implementation, a power threshold level may be specified for indicating a failure of the transitional optical cross talk test. For example, according to a specific implementation, a failure may occur if the power level of light detected on anyone of the darkened paths, for example, exceeds a value of Min_Spec_Power – 3dB, wherein the value Min_Spec_Power represents the minimum acceptable threshold power level of an optical signal. According to specific embodiments, the transitional optical cross talk test may be repeated for all desired combinations of paths, wavelengths and/or polarization states which analysis shows to be relevant.

Another test which may be performed by the OSTS of the present invention is an optical path stability test wherein the stability of a test optical path through the DUT is determined as adjacent or near paths are switched. According to a specific implementation, all or selected paths in the DUT may be darkened except for a path under test whose input will receive one or more test optical signals. The output of the path under test may then be monitored in order to detect the maximum power level of light detected at that output. Relevant adjacent or near paths (as determined, for example, by analysis) may then be switched repeatedly while the output of the path under test is monitored to determine maximum positive variation. The test may then be repeated with the photodetector circuit set to latch the minimum power level of optical signals at the output of the path under test, to thereby determine maximum negative variation. According to a specific implementation, a suggested failure threshold may be

circuits configured or designed measure properties associated with light detected at a plurality of selected DUT output ports, and

a polarization scambler configured or designed to scramble or randomize a state of polarization of test optical signals generated by the OSTS.

15. (Original) The system of claim 1 further comprising at least one power meter for measuring a power level of light.

16. (Previously Presented) A method for performing testing of an optical device under test (DUT), the DUT including a plurality of DUT optical input ports and a plurality of DUT optical output ports, the testing being performed by an optical switching testing system (OSTS), the OSTS including a plurality of OSTS output ports optically connected to a plurality of DUT input ports, the OSTS further including a plurality of OSTS input ports optically connected to a plurality of DUT output ports, the method comprising:

configuring components of the OSTS in order to perform a specific test on the DUT;

configuring a first test scenario at the DUT;

transmitting at least one optical test signal to at least one DUT input port;

obtaining test results by monitoring at least one DUT output port for the presence or absence of light;

analyzing the test results for specific characteristics; and

performing at least one of optical cross-talk testing, insertion loss testing or path switching time testing on the DUT.

17. (Original) The method of claim 16 further comprising:

automatically reconfiguring the DUT for a second test scenario;

automatically implementing the specific test on the DUT; and

obtaining test results associated with the second test scenario from the DUT.

18. (Original) The method of claim 16 further comprising automatically transmitting a plurality of optical test signals to a plurality of DUT input ports during the first test scenario.

19. (Original) The method of claim 18 wherein the plurality of optical test signals are transmitted at substantially a same time to the DUT input ports.

(Also Form PT-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,959,126 B1

DATED : October 25, 2005

INVENTOR(S) : Lofland et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Specifications:

Column 7, line 32, change second instance of "or" to --of--.

Column 10, line 9, change "in according" to --in accordance--.

Column 12, line 28, change "optional" to --optical--.

Column 12, line 50, change "occur is" to --occur if--.

In the Claims:

In line 3 of claim 16 (column 17, line 33) delete "under".

In line 12 of claim 16 (column 17, line 41) change "OSTS" to --DUT--.

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